

What is claimed is:

1. Apparatus for repairing junction of a main pipe line and a lateral pipe line that are connected with one another at a pipe joint, the apparatus comprising:

a liner assembly comprising a main liner tube and a lateral liner tube, the main liner tube
5 being within the main pipe line and the lateral liner tube being within the lateral pipe line, the main liner tube and the lateral liner tube being connected to, and in communication with one another;

the liner assembly being impregnated with a liquid material capable of curing and hardening;

10 a bladder assembly within the liner assembly and having a main bladder tube within the main liner tube and a lateral bladder tube within the lateral liner tube, the main bladder tube and the lateral bladder tube being connected to, and in communication with one another;

a fluid pressure inlet for introducing fluid pressure to the interior of the bladder assembly
15 for urging the main bladder tube and the lateral bladder tube in an outward radial direction to press the main liner tube against the main pipe line and to press the lateral liner tube against the lateral pipe line;

a first hydrophilic band surrounding the main liner tube and being positioned between the main liner tube and the main pipe line on a first side of the pipe joint;

20 a second hydrophilic band surrounding the main liner tube and being positioned between the main liner tube and the main pipe line on a second side of the pipe joint opposite from the first side of the pipe joint;

the first and second hydrophilic bands being made of a hydrophilic material capable of swelling in both an outward and inward radial direction relative to the main pipe
25 line in response to being exposed to liquid so as to form a seal between the main liner tube and the main pipe line on opposite sides of the pipe joint.

2. Apparatus according to claim 1 and further comprising a launcher device within the main liner tube.

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3. Apparatus according to claim 2 wherein the first and second hydrophilic bands surround the main liner tube and the launcher device.

4. Apparatus according to claim 3 wherein the launcher device comprises an elongated
5 launcher member having a launcher cavity therein, an opening being in the launcher member and being registered with the pipe joint.

5. Apparatus according to claim 1 wherein the lateral pipe line and the main pipe line are joined together in a T-shaped configuration.

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6. Apparatus according to claim 5 wherein the liner assembly is also T-shaped in configuration and conforms generally to the T-shaped configuration of the lateral pipe line and the main pipe line.

15 7. Apparatus according to claim 1 wherein the lateral pipe line and the main pipe line are joined together in a y-shaped configuration with the lateral pipe line extending in an oblique direction away from the main pipe line.

8. Apparatus according to claim 7 wherein the liner assembly is also y-shaped in
20 configuration and conforms generally to the y-shaped configuration of the lateral pipe line and the main pipe line.

9. Apparatus according to claim 1 wherein the first and second hydrophilic bands are comprised of a hydrophilic material that is capable of attracting and absorbing liquid.

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10. The apparatus of claim 1 and further comprising a third hydrophilic band surrounding the lateral liner tube and being positioned between the lateral liner tube and the lateral pipe line, the third hydrophilic band being made of a hydrophilic material capable of swelling in both an outward and inward radial direction relative to the lateral pipe line in
30 response to being exposed to the liquid so as to form a seal between the lateral liner tube and the lateral pipe line.

11. Apparatus for repairing a pipe line having a damaged portion permitting liquid to enter from the outside to the interior of the pipe line, the apparatus comprising:
a liner tube within the pipe line and being impregnated with a liquid material that has cured
5 and hardened;
a first hydrophilic band surrounding the liner tube and being positioned between the liner tube and the main pipe line on a first side of the damaged portion;
a second hydrophilic band surrounding the liner tube and being positioned between the
10 liner tube and the pipe line on a second side of the damaged portion opposite from the first side of the damaged portion;
the first and second hydrophilic bands being made of a hydrophilic material capable of swelling in both an outward and inward radial direction relative to the pipe line in response to being exposed to the liquid so as to form a seal between the liner tube and the pipe line on opposite sides of the damaged portion of the pipe line.

12. Apparatus according to claim 11 wherein the pipe line comprises a lateral pipe line.

13. Apparatus according to claim 11 wherein the pipe line comprise a main pipe line.

20 14. A method for repairing a pipe line having a damaged portion capable of permitting liquid to enter from outside the pipe line to inside the pipe line, the method comprising:
taking a liner tube having first and second opposite ends and a longitudinal axis;
surrounding the liner tube with first and second hydrophilic bands spaced apart axially
25 along the longitudinal axis of the liner tube, the first and second hydrophilic bands being capable of expanding in response to exposure to the liquid entering from outside the pipe;
impregnating the liner tube with a liquid material capable of curing and hardening;
placing the liner tube within the pipe line in a position wherein the first and second
30 hydrophilic bands are between the liner tube and the pipe line on opposite sides of the damaged portion of the pipe line;

urging the liner tube in an outward radial direction into contact with the pipe line and with the first and second hydrophilic bands being between the liner tube and the pipe line;

permitting the liquid material impregnating the liner tube to cure and harden;

- 5 whereby the first and second hydrophilic bands will expand when exposed to the liquid entering from outside the pipe and will form first and second seals between the liner tube and the pipe on the opposite sides of the damaged portion of the pipe.

- 10 15. The method according to claim 14 wherein the pipe line is a main pipe line and the liner tube is a main liner tube, a lateral pipe line being connected to the main pipe line at a pipe junction, the damaged portion being in either or both of the main pipe line and the lateral pipe line; the method further comprising taking a lateral liner tube impregnated with the liquid material capable of curing and hardening; inserting the lateral liner tube into the lateral pipe line; urging the lateral liner tube in an outward radial direction into contact with
15 the lateral pipe line; and permitting the liquid material impregnating the lateral liner tube to cure and harden.

- 20 16. The method according to claim 15 and further comprising surrounding the lateral liner tube with a third hydrophilic band capable of expanding in response to exposure to liquid before the inserting of the lateral liner tube into the lateral pipe line, whereby the third hydrophilic band will be positioned between the lateral liner tube and the lateral pipe line and will expand and form a seal between the lateral liner tube and the lateral pipe when exposed to liquid.

- 25 17. The method according to claim 15 and further comprising using a main bladder tube inside the main liner tube and a lateral bladder tube within the lateral liner tube to urge the main liner tube and the lateral liner tube into contact with the main line pipe and the lateral line pipe, respectively.

18. The method according to claim 17 and further comprising connecting the main liner tube and the lateral liner tube together and connecting the main bladder tube and the lateral bladder tube together.